

Questioning Strategies for Science Conceptual Understanding

N A R R O W Q U E S T I O N S

Type of Question	Description	How Do I Ask This Type of Question?	When Do I Use This Type of Question?	Examples	What Thought Processes Do Students Use to Answer This Type of Question?
M E M O R Y	Memory level questions involve answers typically found in sources such as books, web sites, and other reference materials, or brought to mind from previous or “at hand” experiences. <u>Predictable short answer student responses are anticipated and expected.</u>	Who... What... Where... When... Describe... How much ... How many ...	Used to: <ul style="list-style-type: none">▪ Assess/Rein-force prior learning▪ Set the stage (focus attention, build information base)▪ Summarize key points	<ul style="list-style-type: none">▪ Who developed the planetary model of the atom?▪ What did you observe when you added vinegar to baking soda?▪ What color change did you observe when you used iodine to test for starch?▪ How many scoops of salt were needed to create a saturated solution?	Useful if you want students to: <ul style="list-style-type: none">▪ Recall facts▪ Recognize information▪ Define a term▪ Identify something▪ Respond from rote memory▪ Focus attention▪ Count and measure
C O N V E R G E N T	Convergent thinking questions require the organization of facts and ideas, the ability to analyze and put them together, and explain their integration. Students compare, combine, and synthesize information in a direction planned by the teacher. <u>A limited set of specific, predictable student responses is expected.</u>	Why... How... In what ways... What would happen if... How would you show me... What would you do to test... Compare... Contrast... Explain...	Used to: <ul style="list-style-type: none">▪ Guide student toward an idea, but student develops the idea on his/her own terms▪ Extend a student’s ideas▪ Probe and clarify a student’s response	<ul style="list-style-type: none">▪ How does mass differ from weight?▪ How are seasons caused?▪ How does an igneous rock compare to a sedimentary rock?▪ Diagram the transfer of energy from a battery to a bulb.▪ How do the parts of the digestive system work together to break down food?	Useful if you want students to: <ul style="list-style-type: none">▪ Comprehend▪ Explain▪ Transfer▪ Compare and contrast▪ State relationships▪ Analyze▪ Interpret▪ Apply facts, rules, principles▪ Synthesize information to arrive at particular conclusions

B R O A D Q U E S T I O N S

Type of Question	Description	How Do I Ask This Type of Question?	When Do I Use This Type of Question?	Examples	What Thought Processes Do Students Use to Answer This Type of Question?
D I V E R G E N T	Divergent thinking questions are open-ended and focus on material that is largely cognitive. Questions can be classified as divergent only if the teacher is not seeking a specific, planned response. <u>Set of possible student responses is not limited or predictable.</u>	Imagine... Suppose... If..., then... How might... Can you create... What are some possible consequences... Predict.....	Used to: <ul style="list-style-type: none">▪ Extend ideas and expand on area of study▪ Brainstorm▪ Problem solve	<ul style="list-style-type: none">▪ How would you design an experiment to test...?▪ How did you solve that problem?▪ What is your evidence?▪ What might be another explanation for...?▪ What could be done to...?▪ What other factors might be involved...?▪ What would you predict/infer from...?▪ How would you create/design a new...?▪ What solution would you suggest for...?▪ How might life in the year 2100 differ from today?	Useful if you want students to: <ul style="list-style-type: none">▪ Predict▪ Hypothesize▪ Infer▪ Reconstruct▪ Reason▪ Problem solve▪ Synthesize ideas to form an original idea or solution
E V A L U A T I V E	Evaluative thinking questions are characterized by their judgmental quality. Students synthesize information and arrive at a personal preference, opinion, or judgment. <u>Responses reflect students’ personal opinions, preferences, or judgments (as derived from evidence).</u>	Defend How would you judge... Justify... What do you think about... What is your opinion about... Evaluate...	Used to: <ul style="list-style-type: none">▪ Establish an atmosphere in which students recognize that individual opinions are valued▪ Encourage debates, surveys, role plays	<ul style="list-style-type: none">▪ What do you think about...?▪ What makes you like the...?▪ Why do you say...?▪ What is your opinion...?▪ What is the most important...?▪ How would you decide about...?▪ What criteria would you use to assess/evaluate...?	Useful if you want students to: <ul style="list-style-type: none">▪ Evaluate▪ Come to a conclusion▪ Judge